

# AEROSPACE NEWS

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## Liberty™ launch vehicle initiative for NASA's CCDev-2 competition unveiled

Based on the most reliable propulsion systems in the world, the Liberty™ can achieve a first flight by 2013 and close the U.S. human space flight gap.

By George Torres and Trina Patterson

ATK and Astrium (an EADS Company) are working together in response to NASA's Commercial Crew Development-2 (CCDev-2) procurement. The team is offering NASA launch services with the Liberty™ rocket. This new launch vehicle combines two of the world's most reliable propulsion systems, with a collective heritage of nearly 150 successful flights.

ATK would supply the human-rated first stage, which it developed under NASA's Space Exploration Program. The five-segment solid rocket first stage is derived from the space shuttle's four-segment solid rocket boosters (SRB) which are built by ATK and have flown 107 successful missions since 1989 (encompassing 214 SRBs).

Astrium, the developer and manufacturer of the Ariane 5 launcher, working with Snecma (Safran Group), Europe's leading propulsion company, is providing Liberty's second stage based on the liquid-fueled cryogenic core of the Ariane 5 vehicle powered by the Vulcain 2 engine. The Ariane 5 Launcher, operated by Arianespace, has flown more than 40 consecutive successful missions over nearly eight years and has launched more commercial satellites than any other launch vehicle in the world during that time.



An artist's concept of the Liberty™ launch vehicle is shown above, depicted at Kennedy Space Center on a mobile launch platform.

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## ATK awarded NASA's prestigious George M. Low award

By Trina Patterson

ATK Aerospace Systems was honored to be selected as recipient of NASA's George M. Low 2010 award for its quality and performance on multiple NASA contracts. This selection makes the fourth time the company has been chosen for this prestigious award.

The George M. Low Award is NASA's premier quality and performance award for its prime and subcontractors. This award program recognizes large and small businesses that demonstrate excellence and outstanding technical and managerial achievements in quality and performance on NASA-related contracts or subcontracts.

"It is an honor to be recognized for our quality, innovation and performance on the work we do for NASA," said **Charlie Precourt**, vice president and general manager, Space Launch Systems, ATK Aerospace

Systems. "It is a tremendous confirmation to our workforce of their dedication to ensuring success, even during challenging times."

ATK's NASA programs include space shuttle solid rocket boosters and booster separation motors, Ares I first stage, Orion launch abort system's abort motor, and attitude control solid rocket motors, optical structures for the James Webb Space Telescope, Orion's UltraFlex solar arrays, and International Space Station structures, among others, including program support at Goddard Space Flight Center and Langley Research Center.

### Space shuttle program

Over a three-year period ATK performed five full-scale ground tests, cast 15 million pounds of propellant, and delivered 14 flight sets all on schedule and within budget, while ensuring safe operations.

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ATK has been chosen to receive the prestigious George M. Low award four times, including the 2010 award. The 2010 award was given for ATK's quality and performance on multiple NASA contracts.

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## Liberty™ launch vehicle initiative for NASA's CCDev-2 competition unveiled (cont'd)

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The Ariane 5 enjoys the lowest launch insurance rates in the industry due to an unrivaled safety record in the commercial launch services market.

"This team represents the true sense of international partnership in that we looked across borders to find the best for our customers," said **Blake Larson**, president of ATK Aerospace Systems Group. "Together we combine unique flight-proven systems and commercial experience that allows us to offer the market's most capable launch vehicle along with flexibility to meet a wide variety of emerging needs. Liberty provides greater performance at less cost than any other comparable launch vehicle."

Liberty would be a two stage launcher able to deliver 44,500 pounds to the International Space Station orbit, which would give it a launch capability to carry any crew vehicle in development. Both stages were designed for human-rating since inception and would enable unmatched crew safety. Since Liberty uses qualified, proven and reliable systems, the team has planned an initial flight by the end of 2013, a second test flight in 2014 and operational capability in 2015.

"The Liberty initiative provides tremendous value because it builds on European Ariane 5 launcher heritage, while allowing NASA to leverage the mature first stage," said **Charlie Precourt**, vice president and general manager of ATK Space Launch Systems. "We will provide unmatched payload performance at a fraction of the cost, and we will launch it from the Kennedy Space Center using facilities that have already been built. This approach allows NASA to utilize the investments that have already been made in our nation's ground infrastructure and propulsion systems for the Space Exploration Program."

The advantages of the Liberty launch system are extensive. It is built on a solid foundation of human-rated launch technology, and leverages billions of dollars of investments by NASA and NATO-allied European governments in the frame of the European Space Agency. This international effort—which embodies the spirit of global cooperation articulated in the recent National Space Policy—will afford NASA a readily available, cost-effective solution for human spaceflight.

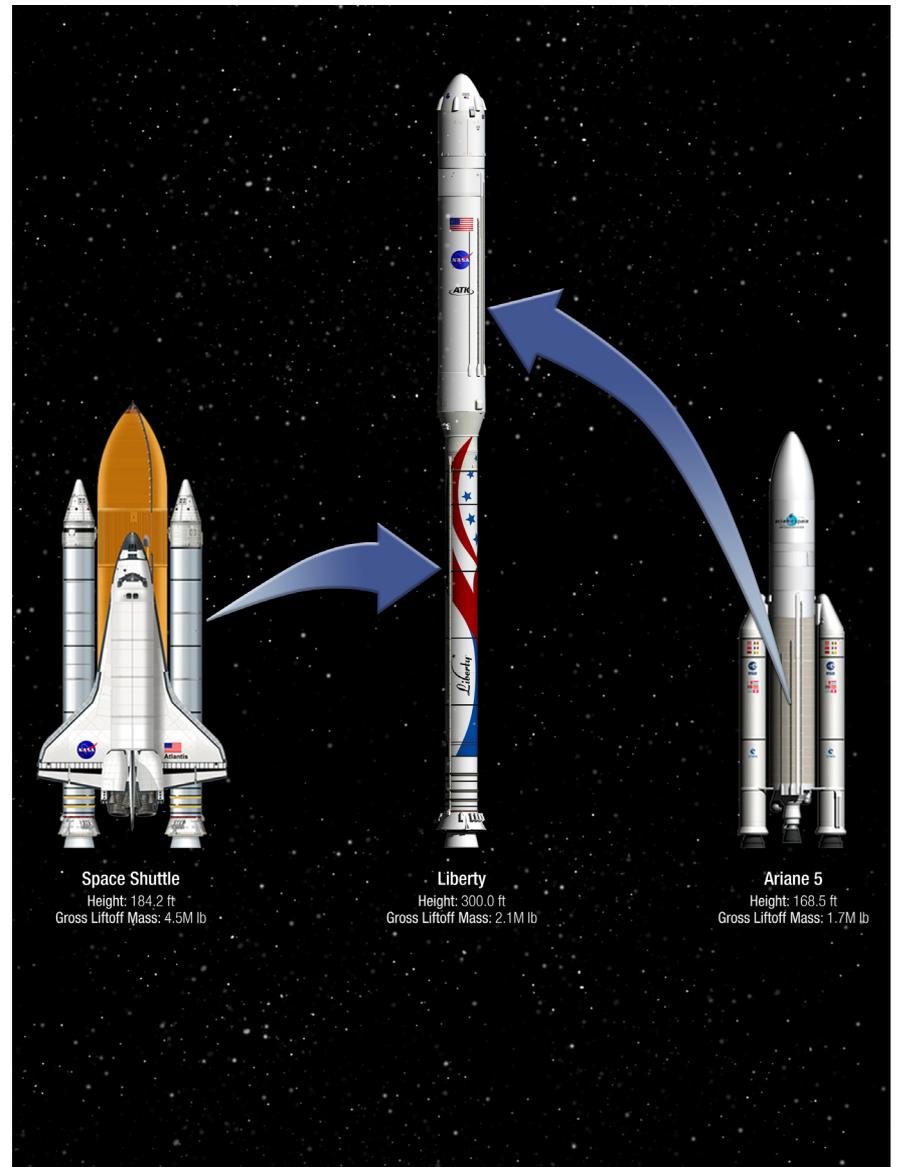
Finally, NASA is already extremely familiar with the Ariane and ATK launch systems, both of which have played historic roles in directly supporting NASA's mission.

The five-segment first stage design is based on more than 30 years of safety-driven improvements on the space shuttle program. The result is a higher performing, more reliable solid rocket motor, which equates to increased safety for crew and mission success for cargo. Besides adding a fifth segment, ATK also enhanced the propellant grain, provided a larger nozzle opening, and upgraded the liner and insulation—all designed to meet performance requirements and increase reliability while significantly lowering manufacturing costs.

The five-segment first stage was successfully ground tested twice (September 2009 and August 2010), and the successful Ares I-X flight test in October 2009 demonstrated vehicle proof of concept and vital flight performance of a launch vehicle configuration very comparable to Liberty. It also demonstrated effective vehicle integration, ground processing and launch operations.

Other Liberty team members include: United Space Alliance (USA) of Houston, Texas, and Kennedy Space Center, Florida, for launch vehicle integration and ground operations support, and L-3 Communications of Cincinnati, Ohio, for first stage avionics.

**ATK and Astrium are developing the Liberty™ launch system as part of a new international commercial space transportation business. Liberty's availability can be accelerated by CCDev-2 Program funding.**



Based on the most reliable propulsion systems in the world, the Liberty™ launch vehicle can achieve a first flight by 2013 and close the U.S. human space flight gap.

### The Liberty Vehicle Offers:

- Safest, most reliable launch vehicle
  - Heritage design and experience
  - Existing stages – minimal remaining development
  - Designed for human-rating (space shuttle and Hermes programs)
  - Absolute minimum “moving parts”
- International cooperation – advances U.S. National Space Policy
- Commercial approach to acquisition – lowest cost to government, advances U.S. National Space Policy
- Maximum leverage of existing NASA and ESA investments – multi \$B from space shuttle, Ariane 5 and Constellation
- Maximum utilization of existing NASA KSC & MSFC assets and infrastructure
- Strong business case – best value for our space program, low remaining development cost jumpstarts the business
- Synergistic with NASA's Heavy Lift planned investments – Both programs benefit by using common infrastructure

# Rear Admiral Benedict pays visit to thank ATK employees

By Trina Patterson

“I am going to start off by saying thank you.” Gratitude and a charge to keep focused on safety and mentoring was the message from **Rear Admiral Terry Benedict**, director, Strategic Systems Program for the U.S. Navy, as he addressed an ATK employee all-hands meeting January 14 at Bacchus.

Benedict’s organization oversees the Trident II (D5) program for the Department of Defense. The program has been in operation for more than 25 years, during which ATK has cast motors that equate to 70 million pounds of propellant supporting multiple ground and flight tests. The Admiral wanted to speak to the workforce who delivered such success.

“Your efforts have been responsible for 134 consecutive successful flight tests—some-

thing that has never been replicated in the Department of Defense,” said Benedict. “We have remained on schedule and within budget, continually delivering a weapon system that works—it gives us great leverage, and it is a result of your efforts.”

The Admiral touched on the future of the program and how D5 will remain a critical component for the foreseeable future as the new Ohio Replacement System is baselined with the missile to 2080. The D5 system will also remain on the replacement for Britain’s Vanguard-class submarines. Both of these programs would require block upgrades to account for aging material while maintaining the D5’s reliability and accuracy.

Benedict’s main concern for the future is the solid rocket propulsion industry viability as NASA makes important decisions. He said he has been in multiple meetings within the DoD and congress and has communicated his

strong concern that something he cannot control or solve is a national problem. He told employees he is ATK’s advocate on this issue, and the solid rocket motor industry is a top priority and must be watched daily.

With the recent changes with NASA programs, and as ATK has downsized, the Admiral noted two areas he wanted employees and management to stay highly focused on—mentoring the younger

workforce and continuing safety.

“As you downsize, I want to know how you are going to ensure employees are still safe and we do not have a safety accident,” said Benedict. “An accident would affect you, this business and this program, and we cannot afford it—there is no room for error.”

Ensuring ATK’s high-commitment to safety and quality is continuing through training the next-generation workforce was also critical to Benedict. He stated that with the D5 remaining operational to 2080, ATK needs to tap the knowledge of those currently on the program while mentoring the right people to continue to carry this program and successful legacy forward.

“I truly believe this program is a world game-changer, and we are signed up to do it for years,” said Benedict. “I admonish you to continue your efforts to ensure its success, and I’ll close with the same sentiments I started with—thank you.”



ATK employees had the opportunity to hear Rear Admiral Terry Benedict speak about the successful Trident II (D5) program.

## All-hands highlights

During the meeting, the Admiral presented ATK’s D5 program with a letter recognizing efforts in delivering a zero-defect nozzle in 2010 while reducing the lead time from 29 to 18 weeks.

Six employees received awards for their contribution to the D5 program. They were **Twig Jacobsen, Steven Sargent, Kim Parry, Curt Bloxham, Robin Bawden** and **Mike Haines**.



## ATK supports launch of Delta IV Heavy

By Trina Patterson

ATK composite and propulsion technologies supported the successful January 20 launch of a United Launch Alliance Delta IV rocket carrying a National Reconnaissance Office (NRO) payload. The mission is in support of national defense.

ATK supplied 16 key composite structures for the launch vehicle: three thermal shields that house and protect the engines during flight, three centerbody structures that connect the liquid oxygen (LO<sub>2</sub>) and liquid hydrogen (LH<sub>2</sub>) tanks, two medium and one heavy skirt on the three Common Booster Cores (CBC), the composite interstage on the center CBC, the nose cones on the two strap-on engines, one set of x-panel truss structures

that connect the upper stage LOX tank with the upper stage hydrogen tank. The payload is encapsulated by a five meter (200-in) diameter composite payload fairing, along with required hardware for payload integration: the payload attach fitting and payload attach fitting diaphragm.

The composite structures range from 4 to 5 meters in diameter and up to 19.1 meters (62.7 feet) in length. They were produced using advanced hand lay-up, machining and inspection techniques at ATK’s production facility in Iuka, Mississippi, with the x-panels being produced in Clearfield, Utah.

ATK designed and produced the nozzle for the Pratt & Whitney Rocketdyne-built RS-68 engine as well as the nozzle’s thermal protection material, which is capable of shielding it from the extreme heat of launch when external temperatures can exceed 4,000 degrees Fahrenheit. The Delta IV’s RS-68 is the largest hydrogen-fueled engine in the world, utilizing an ATK nozzle that is the first of its kind in a liquid booster engine. The nozzle is manufactured at ATK’s Promontory, Utah, facility.

On January 20, a United Launch Alliance Delta IV Heavy launched from Vandenberg Air Force Base, California. The Delta IV Heavy is the largest rocket ever launched from the west coast of the U.S. (United Launch Alliance photo)

# New Propulsion Systems leaders brief employees at all-hands meetings

By Kay Anderson

New Integrated Operations leadership conducted all-hands meetings January 17-20 for employees in the Science & Engineering, Safety & Mission Assurance, and Production Operations organizations. Along with **Dave Sebahar**, vice president of Integrated Operations, the new leaders for the three organizations, **Stan Graves**, **Jim Halsell** and **Jim Nichols**, addressed nearly 2,000 employees in a total of 13 meetings at three locations in Utah.

A key purpose for the all-hands meetings included discussion of the new organization's structure and to introduce new members of the leadership team to employees.

"We've come a long way and accomplished so much through the strength of your efforts and your will to succeed," said Sebahar. "Now we need your continued support along with your input."

Leadership stressed that as the organization moves ahead they will be evaluating different options to develop lean, effective operating strategies—nothing is set in concrete. The new leadership team will work together to chart the path forward. It is their first priority to understand the current condition of the organizations within Integrated Operations, including the leadership, processes, issues and challenges.

"We've been doing things the same way for a long time," said Graves. "We have to be

open to new ways of doing things in order to be competitive."

What leaders are looking for from employees within Propulsion Systems is:

- A relentless focus on safety
- Continued focus and execution of their jobs
- Ideas from employees to let them know what is working well and where changes are needed
- Understanding, patience and acceptance of additional change

Secondary priorities include looking at required organizational changes, efficiency opportunities, consolidation opportunities and goal alignment.

"We're great at what we do," said Halsell, "but now we need to figure out how to do it in a more cost-effective way, while continuing our safety and quality focus."

"We're studying best practices, such as concurrent engineering and standard practices, which will naturally make us more efficient," said Nichols.



Jim Halsell speaks to a group of employees in Clearfield during a series of 13 all-hands meetings Integrated Operations leadership conducted for Science & Engineering, Production Operations, and Safety & Mission Assurance employees.

Following the presentation by the leaders, employees were given the opportunity to ask questions. Additionally, comment cards were provided for employees to use if desired, to express what they had hoped to learn from the meeting, to share any ideas with leadership and to provide general feedback. More than 175 comment cards were turned in at the meetings and are being addressed.

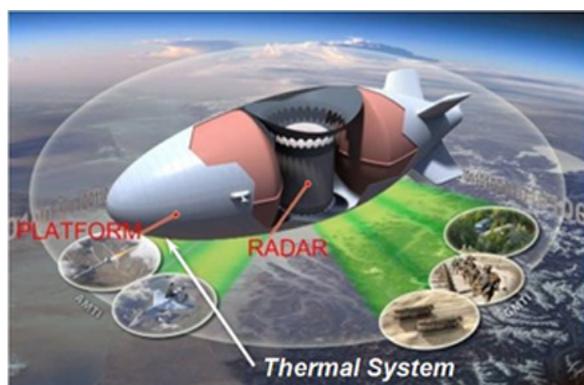
The Integrated Operations organization reports to Propulsion Systems' business lane leaders **Charlie Precourt** (Space Launch Systems), **Scott Lehr** (Strategic & Commercial Systems) and **Mark Messick** (Advanced Systems).



Integrated Operations leaders recently spoke to employees in a total of 13 all-hands meetings at Promontory (right), Bacchus (far right) and at Clearfield.



# ATK selected to provide thermal control subsystem for DARPA ISIS airship



ATK will provide the Thermal Control System for the Integrated Sensor is Structure program. This contract is a critical component of the Defense Advanced Research Projects Agency ISIS Airship.

By Vicki Cox

ATK has been selected to provide the Thermal Control Subsystem for the Integrated Sensor is Structure (ISIS) program. The contract, awarded by Lockheed Martin, is a critical component of the Defense Advanced Research Projects Agency (DARPA) ISIS Airship. Lockheed Martin leads an industry team in the development of an airship-based autonomous unmanned sensor with unique capabilities to track ground and air targets.

"This award is a strategic win for ATK because it marks our first thermal award in this high altitude, near-space defense market," said **Tom Wilson**, vice president and general manager, ATK Spacecraft Systems & Services.

"We are a world leader in the design and production of heat transport devices with the corporate commitment and resources to deliver top-quality hardware on schedule. Our record of proven performance will enable us to continue to expand into adjacent markets while exceeding the expectations of our current customers."

The scope of work to be performed on the ISIS program includes designing, developing, building and testing hardware that performs heat acquisition, heat transport and heat rejection for two complete thermal systems. The baseline design for both systems is a pumped two-phase fluid loop that interfaces with large, lightweight radiator panels attached to the vehicle powerbay. Work on the contract will be performed at ATK's Beltsville, Maryland, facility.

# First shipment of Minuteman PEP/SRMWL motors completed

By George Gonzalez

Marking a major accomplishment for the Minuteman Propulsion Extension Program/Solid Rocket Motor Warm Line (PEP/SRMWL), the first shipment of all three motor stages has been completed. The first Stage 1 motor was shipped from Promontory to Hill Air Force Base (HAFB) on August 3. The Stage 2 and Stage 3 motors were shipped from Bacchus on September 2 and October 19, respectively.

The first Minuteman motors were manufactured and delivered by ATK (then Thiokol and Hercules) for deployment in 1962. Since that time, ATK has manufactured over 4,000 Minuteman motors. In 2009, ATK completed a very successful 10-year Minuteman Propulsion Replacement Program (PRP) that employed all of the ATK Utah campuses and produced well over 1,800 re-manufactured motors.

ATK continues to play the critical role it has since the 1950s in the development and sustainment of the propulsion system for the Minuteman Intercontinental Ballistic Missile weapon system. The first shipment of the PEP/SRMWL motors is further evidence of this success.

“Given today’s reduced rocket motor industrial base, ATK’s role and the importance of the PEP/SRMWL program is even more critical in the sustainment of the Air Force’s Minuteman weapon system,” said **Mark Beus**, ATK’s director of Minuteman Programs. “The program sustains Minuteman specific skills and capabilities, while also providing a resource for the weapon system to draw from should the need arise in mitigating hardware or age-related issues.”

Beus commends the ATK workforce for the excellent quality that was demonstrated during the PRP program and projects and said, “The PEP/SRMWL motors will be every bit as excellent and will serve as a continued testament to the skills and capabilities being maintained.”

The Minuteman weapon system is projected to be sustained through 2030. PEP/SRMWL is designed to sustain critical propulsion-related skills and ensure the weapon system can be sustained until an age life of the motors can be predicted.

Government fiscal year 2010 (GFY10) is the start of the PEP/SRMWL program, and although ATK has just completed delivery of the first motor set, the program is well into its first year’s production with five of the six motor sets already received and in work at all three Utah campuses. ATK continues to work with its customer, Northrop Grumman Corporation, and is now in the process of finalizing the contract for the second year’s production, GFY11.



Employees from Northrop Grumman and ATK review the first Minuteman Propulsion Extension Program/Solid Rocket Motor Warm Line Stage 1 motor just prior to shipment to HAFB.



ATK employees prepare a Minuteman Propulsion Extension Program motor for shipment in October 2010.

Up to six Minuteman motor sets per year will be manufactured under the PEP/SRMWL program. The remanufacture process begins at Promontory for all three stages, while the Stage 3 insulated case is manufactured new at Clearfield. The Stage 1 motor is finalized and delivered from Promontory, while Stages 2 and 3 are final-

ized and delivered from Bacchus. The objective is to make each motor identical to those manufactured under PRP and demonstrate them in a static test each year with one of each stage being tested every six motor sets. Stage 1 will be tested at Promontory, and Stages 2 and 3 will be tested at Arnold Engineering Development Center.

## ATK honored as Patriotic Employer

By Holly Lamb

The National Committee for Employer Support of the Guard and Reserves (ESGR) honored ATK and Live Area Inspection manager, **Kary Hansen**, as patriotic employers February 1 at the ATK Aerospace Systems Promontory facility.

**Norman Nelson**, military outreach coordinator for the ESGR Utah Committee, specifically recognized support provided to **Carey Wilkerson**, an ATK quality technician who also serves as a paralegal non-commissioned officer in the U.S. Army Reserves. "With so many deployed, it can be tough on companies," said Nelson. "It is awesome to see companies that go out of their way to make sure these reservists are taken care of and have a job to come back to."

With nearly 18 years of military service, Wilkerson has been called upon multiple times for duty, sometimes with only ten days of advance notice to ATK. In his military role, Wilkerson assists deployed troops with establishing wills, power of attorney and other legal matters.

Hansen stated the obligation exists to support those who are deployed. "It is because of the men and women in uniform we are free to do what we do," he stated.



Pictured are Phil Jones, quality manager; Cary Wilkerson, quality technician and U.S. Army Reservist; Kary Hansen, Live Area Inspection manager; Norm Nelson, ESGR; Lt. Col. Chad Lusher, DCMA; Jim Halsell, vice president, Quality, Safety & Mission Assurance.

## Northrop Grumman commends ATK San Diego for work on radomes



A Global Hawk airplane, using ATK radomes, is shown above.

By Jennifer Bowman

Northrop Grumman's High Altitude and Long Endurance (HALE) Global Hawk program leadership recently sent a letter expressing their appreciation to the ATK HALE team in San Diego for its role in helping the program meet a major customer commitment—the on-schedule fly-off of Air Force Global Hawk unit #24. The ATK team successfully expedited re-coating the Common Data Link and Satellite Communication Radomes for enhanced electro-static discharge (ESD) protection, eliminating risk to sensitive electronics on the aircraft.

ATK's team successfully completed this effort in record time (one-week turn) using new and improved coating procedures and ESD test methods co-developed with on-site Northrop engineering staff.

Northrop's HALE leadership stated that meeting this program commitment "was impossible to achieve without ATK's diligence, perseverance and customer focus." They also praised ATK's level of timely support and quality. Congratulations and thanks to the ATK HALE team members for their success and for representing the Aerospace Systems Group in such a commendable manner.

A radome (radar dome) is a structural, weatherproof enclosure that protects a radar antenna. The radome is constructed of material that is transparent to radio waves (i.e. epoxy resin, fiberglass, polyimide honeycomb core). Radomes are aerodynamic surfaces that protect the antenna from the environment, including wind, rain, ice, sand and ultraviolet rays) and conceal electronic equipment from public view.

## ATK wins contract to develop system for monitoring motor health

By Jennifer Bowman

The Air Force Research Laboratory (AFRL) recently awarded ATK a contract to develop a system capable of accurately predicting whether or not a specific solid rocket motor is able to perform its intended mission. The first two tasks of the Integrated Motor Life Management Data Acquisition and Analysis System (IMLM-DAAS) program, valued at \$2 million, are now underway and will keep approximately six Science & Engineering employees busy for the next two years. Two additional tasks could be added later, bringing the total contract value to \$7.3 million.

"This is a great win by **Bob Wardle** and the Advanced Technologies and Products team," said **Mark Messick**, vice president and general manager, Advanced Systems. "We look forward to leveraging our extensive experience in solid rocket motors to develop an integrated system for assessing motor health."

ATK and the Air Force Research Laboratory have been creating innovative components for monitoring motor health for more than a decade. Now the IMLM-DAAS program team is developing an integrated system architecture based on these components. The system will provide constant real-time monitoring of individual motors, beginning while the motor is still in final assembly and continuing through the duration of its service life.

The data collected will be used to assess the motor's health in the present, and to predict its health in the future.

"This system will enable the customer to identify good and bad resources at a much lower cost," said **Hank Dovey**, senior manager, Advanced Technologies and Products. "Monitoring the individual motors is projected to be less expensive than performing traditional aging and surveillance testing, and also eliminates the need to extrapolate the health of an entire fleet of motors based on the results of a small sample."

ATK received the only award made under this competitively-bid Broad Area Announcement, an indication of AFRL's confidence in ATK's ability to execute this contract.

# Aircraft Commercial Center of Excellence (ACCE) construction update

By Heather Kralik and Jamie Smith-Dicks

Construction activities for ATK's Aircraft Commercial Center of Excellence (ACCE) are in full swing. The state-of-the-art manufacturing facility, which will support the manufacturing of commercial airframes and engine components for the A350, GENx and Rolls-Royce programs, has seen a frenzy of activity over the past few months as it prepares to become the center of ATK's continued expansion into commercial aircraft for domestic and international markets.

The ACCE facility is undergoing dramatic changes as the implementation plan is realized. The number of contractors on-site will be an estimated 200 to 300 during peak work activities, and only authorized personnel are allowed on the factory floor. On-site personnel have undergone safety training that is required for the active construction zone, and hard hats, safety shoes, safety glasses and reflective vests are mandatory.

## Construction highlights

- Layton Construction was selected in December as the general manager on the project
- Painting of ceiling deck around stringer clean room is complete
- Walls for stringer clean room started week of January 10
- Outside concrete work started week of January 10
- Concrete sections of the factory floor have been removed to prepare for the foundations that will support production machines
- Ductwork and electrical components are being installed
- Office remodeling has begun
- Plumbing and piping is in process
- Polishing of the existing concrete floor has begun



Construction on ATK's Aircraft Commercial Center of Excellence is shown in the above photo.

- Rail spurs are being removed

The scope and intensity of the project will continue to increase as we work to meet our goals. In August 2011 when the factory transformation is complete, the ACCE facility will feature a full range of composite structures design and production capabilities for full rate production.

# ATK awarded NASA's prestigious George M. Low award

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## Ares I first stage program

As the prime for Ares I first stage, ATK is the complete stage integrator, which includes responsibility for human space flight first stage avionics and control systems, recovery systems, stage separation systems, pyrotechnic systems and large structural assemblies. The five-segment design was accomplished in 11 months, with 10 successful parachute recovery system tests and 11 ground tests of motors, igniters and stage separation systems were successfully performed including two full-scale five-segment tests. The company also served as the prime for the first stage of the Ares I-X test flight which successfully launched October 28, 2009.

## Ares I avionics

As part of this program, the company developed an innovative engineering development lab that enabled early risk reduction on the program as well as detection of system integration issues. In three years ATK was able to take a human-rated avionics subsystem from concept of design all the way through subsystem level testing.

## Orion Launch Abort System (LAS) abort motor

ATK produced an innovative high-thrust (~400K lbf), turn-flow motor to serve as the main abort propulsion for the LAS. The program successfully completed development with five subscale turn-flow static tests, an open-air igniter static test and one full-scale ground static firing demonstrating the new solid rocket motor concept and validating per-

formance models. These tests culminated in the highly successful Pad Abort-1 flight test, all while executing within performance, cost and schedule requirements.

## Orion Launch Abort System (LAS) attitude control solid rocket motor

ATK produced a revolutionary solid propulsion attitude control motor (ACM) for NASA which vastly improves crew safety by providing pitch and yaw control for the Orion capsule in the event of a launch abort at all altitudes and conditions. The motor and single-fault-tolerant control system, including controllers, software, actuators and batteries, were developed in a series of component level tests, five flight-weight single and double valve tests, and two full scale ground tests. This comprehensive testing validated all system models, hardware and software, ensuring a highly successful PA-1 flight test where the ACM performed exactly as designed.

## James Webb Space Telescope (JWST)

ATK is a key partner on JWST responsible for the design, engineering, fabrication and testing of the optical telescope element and integrated science module structural assemblies. The development of these critically stable structures have advanced state of the art for cryogenic composites providing operational stability of 38 nanometers at 30K (-406oF). The primary structures include the primary mirror backplane support, deployment tower assembly, secondary mirror structures, and ISIM optical bench. The company has achieved excellent performance ratings on this program, earned three gold

supplier awards, and was recognized for outstanding contributions by earning the 2010 Goddard Space Flight Center Contractor Excellence Award.

## Orion solar arrays

ATK's innovation is highlighted in the design of the 19-ft-diameter round UltraFlex solar arrays for NASA's Orion crew vehicle. The design is based on the solar arrays used to power NASA's successful Mars Phoenix Lander program, and further developed into a larger Orion-size array as part of ground testing performed on NASA's New Millennium Space Technology 8 program (ST-8)

## International Space Station

ATK supplied the 100 ft long deployable masts used to unfurl the eight large ISS solar arrays, as well as key components for the two giant Solar Alpha Rotary Joints (SARJ) which allow sun tracking of the ISS solar arrays. ATK's contributions were key to helping build the ISS and bring it into full operation. "These programs highlight the breadth of ATK's NASA programs," said Precourt. "I believe it speaks volumes about our culture and the work of our employees who continue to meet and exceed expectations in our performance."

This award was named after George M. Low, a pioneering NASA leader who was dedicated to quality and excellence. George M. Low's career and achievements spanned many fields, including space science, aeronautics, technology and education. He provided management and direction for the Mercury, Gemini, Apollo and advanced manned missions programs.

# Lean ideas lead to green improvement and waste reduction

By Bill Ansel

What started out as simply an observation to reduce the waste of motion and travel by employees in the bus cell layup area in San Diego's Space Structures Bus Cell, turned into a larger opportunity to reduce electrical energy and liquid nitrogen consumption as well. The layup team delegates and support staff have been meeting twice weekly to foster continuous improvement ideas at the Gemba (work area). At these bi-weekly stand-up meetings, team members bring problems, issues and opportunities that they recognize as a form of the seven types of waste (waiting, conveyance/transportation, over-processing, inventory, motion, defects and overproduction) to the support team looking for ways to help resolve and therefore eliminate the waste. Some of the tasks the team identified as waste include: having to gather and bag the cutoff, scraps and remnants of material and then move them to the autoclave area for cure so the hazardous material is baked out. Those steps caused team members to have to handle and



store the material several times (motion and inventory), bag the material (over-processing), move the material to another building (transportation), and cure it (over-processing), allowing the material to be disposed of as solid waste instead of passing it on as more expensive hazardous waste.

Elimination and reduction of cutoff scraps and remnant was looked at previously, and subsequent improved nesting efforts reduced some of the leftovers, but there was still some cutoff material to be disposed. The first thought was to improve the process to capture, bag and cure the remnants by putting tools at point of use and getting pre-fabricated bags thereby reducing motion and treating the bag as a commodity rather than a custom made bag each time. When the team started asking the 5 Why's, driving towards an ambient air cure rather than an expensive autoclave cure, the team asked the question, "Why even bother bagging and curing at all?" The team then engaged the Materials and Process Engineering and Environmental, Health and Safety departments to become involved and challenge the legacy process of bagging and curing material

to eliminate the hazardous waste element of the material.

The next step was to test the material to determine if a hazard exists. Testing was done on all the materials, and the results showed that all but one of the materials was deemed to be non-hazardous, therefore most cutoff remnants are able to go directly into the mainstream waste rather than bagging and curing in an autoclave. This saves bagging material and labor, transportation to the autoclave, liquid nitrogen, electrical power and autoclave equipment wear and tear. The estimated labor and autoclave charge savings is \$28,000 annually. Training and visual controls are in place to ensure that the one, seldom used, distinctly different material that still needs to be treated and disposed of as hazardous waste is segregated and handled as hazardous waste in the bus layup area.

What "lean and green" opportunity is next? This effort was concentrated in the bus layup cell where similar materials are used regularly. San Diego employees recognize there is opportunity across the site by applying the same logic to the base layup cell and further reducing those same "seven types of wastes," thereby generating more green savings and reducing non-value added steps.

## Promontory and ABL partner on project—Moving closer to One ATK

By Kellee Thompson

Aerospace Systems employees met with employees at Allegany Ballistics Lab (ABL) in Rocket Center, West Virginia, regarding AeSG capabilities that could benefit ABL. AeSG Promontory's E-517 Machine Shop was asked to fabricate RDX hoppers to support processing needs at the ABL facility.

The project included a number of details in preparation for doing the actual work, including getting an internal work order in

place to bring the business to Promontory. Upon receipt of the contract there was also extensive effort from Promontory engineering, led by **Kip Richards**, to ensure all safety requirements were met.

Because of special design requirements, not all materials were readily available, which required **Craig Smith** from the Tool Planning organization to seek out special grades of stainless steel needed to complete the project.

Once the production effort began, there were many challenges and a large learning curve to overcome, which was successfully

accomplished due to the leadership of **Rick Jensen** and **Jeff Wood**.

Jensen and Wood, along with a group of welders and machinists dedicated over three months to fabricate what proved to be what **Jim Tedesco**, Missions Assurance manager at ABL, called, "The best hopper we have ever had."

Tedesco was on-site at Promontory January 14 and 15 to accept the tool before shipment and to ensure all requirements met the needs at the West Virginia plant.

Overall, the first of the contracted hoppers was a great success. While **Dixon**

**Brockbank** managed the program from the Advanced Systems group, **Daryl Anderson**, **Mark Beseris** and **Con Christofferson** were a critical part of the success by supporting all non-destructive test efforts to ensure a defect-free tool was delivered to the customer.

The success of this tool could bring future business to the Promontory machine shop to supply other ATK sites with facilities, tools or components to help meet their needs.



Aerospace Systems at Promontory (shown above) worked with employees at Allegany Ballistics Lab in West Virginia on a project that benefited both sites.

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